CLAIMS

1. A sealing structure which seals gaps between a heating furnace for heating a solid material and a liftable solid-transferring screw extending through side walls of the heating furnace, wherein

the solid-transferring screw has a driving shaft substantially horizontally arranged and a helical blade fixed on the driving shaft;

the driving shaft passes through through-holes for screw-driving shaft which are formed in the side walls of the heating furnace, each of the through-holes having a vertical size which is larger than the diameter of the driving shaft by at least a lifting range of the solid-transferring screw, the driving shaft being supported by liftable supporting devices which are disposed at the outsides of the heating furnace;

sealing blocks are attached on the outer edges of the through-holes for the screw-driving shaft so as to surround the periphery of the through-holes at the outsides of the heating furnace; and

sliding panels are disposed at the outer sides of the sealing blocks of the furnace, each of the sliding panels having a sliding hole for sliding the screw-driving shaft so that the driving shaft extends through the sliding hole, each of the sliding panels being slidable in the vertical

direction while airtightness between the sliding panel and the sealing block is retained.

2. The sealing structure for the solid-transferring screw according to claim 1, further comprising at least one sealing member that surrounds the driving shaft between the corresponding sealing block and the corresponding sliding panel, wherein

the sliding panel is brought into contact with the sealing block with the sealing member therebetween.

3. The sealing structure for the solid-transferring screw according to claim 1, further comprising sealing devices for sealing gaps between the driving shaft and the sliding holes for sliding the screw-driving shaft.

4. The sealing structure for the solid-transferring screw according to claim 1, further comprising lifting members and couplers disposed at the outsides of the heating furnace, wherein each of the lifting members is fixed on the corresponding supporting device and cooperatively moves up and down with the supporting device, and each of the couplers connects the corresponding lifting member and the corresponding sliding panel.

5. The sealing structure for the solid-transferring screw according to claim 4, wherein each of the couplers is pivoted to the corresponding lifting member and the corresponding sliding panel.

6. The sealing structure for the solid-transferring screw according to claim 3, wherein the sealing devices and the sliding panels are connected with respective expansion joints.

7. The sealing structure for the solid-transferring screw according to claim 1, further comprising biasing devices for biasing the sliding panels to the sealing blocks.

8. The sealing structure for the solid-transferring screw according to claim 2, wherein two or more sealing members are provided and at least one inert-gas suction channel for injecting inert gas is disposed between these sealing members.

9. The sealing structure for the solid-transferring screw according to claim 1, wherein each of the sliding panels comprises a combination of a plurality of sliding panel members so that the solid-transferring screw can be extracted from the furnace by removing a part of the sliding

panel members.

10. The sealing structure for the solid-transferring screw according to claim 4 or 5, wherein the lifting members disposed at the outsides of the heating furnace are integrated with each other.

11. A method for producing a reduced metal by heating and reducing a metal oxide containing a carbonaceous reducing material, comprising the steps of:

feeding the metal oxide into a heating furnace for heating the metal oxide;

leveling the metal oxide fed into the heating furnace in the feeding step with a material-leveling screw; and

heating the metal oxide evenly laid in the leveling step for reducing;

wherein

the material-leveling screw comprises a driving shaft and a helical blade fixed on the driving shaft;

the driving shaft passes through through-holes for screw-driving shaft which are formed in the side walls of the heating furnace, each of the through-holes having a vertical size which is larger than the diameter of the driving shaft by at least a lifting range of the solid-transferring screw, the driving shaft being supported by

liftable supporting devices which are disposed at the outsides of the heating furnace;

sealing blocks are attached on the outer edges of the through-holes for the screw-driving shaft so as to surround the periphery of the through-holes at the outsides of the heating furnace; and

sliding panels are disposed at the outer sides of the sealing blocks of the furnace, each of the sliding panels having a sliding hole for sliding the screw-driving shaft so that the driving shaft extends through the sliding hole, each of the sliding panels being slidable in the vertical direction while airtightness between the sliding panel and the sealing block is retained.

12. A method for producing a reduced metal by heating and reducing a metal oxide containing a carbonaceous reducing material, comprising the steps of:

feeding the metal oxide into a heating furnace for heating the metal oxide;

heating the metal oxide fed into the heating furnace in the feeding step for reducing; and

discharging the resulting reduced metal in the heating step with a product-discharging screw;

wherein

the product-discharging screw comprises a driving

shaft and a helical blade fixed on the driving shaft;

the driving shaft passes through through-holes for screw-driving shaft which are formed in the side walls of the heating furnace, each of the through-holes having a vertical size which is larger than the diameter of the driving shaft by at least a lifting range of the solid-transferring screw, the driving shaft being supported by liftable supporting devices which are disposed at the outsides of the heating furnace;

sealing blocks are attached on the outer edges of the through-holes for the screw-driving shaft so as to surround the periphery of the through-holes at the outsides of the heating furnace; and

sliding panels are disposed at the outer sides of the sealing blocks of the furnace, each of the sliding panels having a sliding hole for sliding the screw-driving shaft so that the driving shaft extends through the sliding hole, each of the sliding panels being slidable in the vertical direction while airtightness between the sliding panel and the sealing block is retained.